

LOCAD Demonstration and Field Testing

A major component of instrument development for the LOCAD team is extensive operational tests in the laboratory and the field. Field sites are often extreme environments that mimic those expected on Mars or the lunar surface. Listed below are a few of the extreme environments in which LOCAD instruments have been tested.

For more information regarding the data collected during these tests, procedures, and the LOCAD technologies utilized, please see our Publications page ([hotlink](#)).

Demonstrations:



● **International Space Station Operations**

Initial goals:

- Test the hardware in a space mission environment
- Perform survey of the distribution of the microbial molecules endotoxin, beta-glucan and peptidoglycan.
- Demonstrate crew procedures to collect and process surface samples without biological contamination

Preliminary results:

- First phase of operations were conducted April-May 2007
 - Determined that the instrument functioned nominally
 - Performed side-by-side analysis with culture-based methods and LOCAD-PTS
 - Performed successful positive and negative controls
- Second phase of operations were conducted December 2007 – February 2008
 - Collected a variety of surface samples throughout the ISS
 - High endotoxin recorded at ‘high-use’ areas (e.g., treadmill, bathroom) and at sites significant for planetary protection issues (e.g., airlock)
- Tests for beta-glucan (a fungal molecule) was conducted in June and August 2008

Future operations:

- Complete ISS survey for beta-glucan
- Begin tests with third type of cartridge, for detection of gram positive bacteria (scheduled to begin in late 2008/early 2009)



● **Microgravity Tests aboard the C-9**

- All crew procedures for sampling and analysis with LOCAD-PTS have been tested in microgravity during parabolic flight of NASA’s C-9 aircraft
- These tests were critical in order to prepare for launch of the PTS to the ISS

Field/Environmental Tests:



● **Arctic Mars Analogue Svalbard Expedition (2003-present)**

- LOCAD-PTS tested in 2004, 05, and 06 prior to launch

- Extended PTS tested in 2006 and 07
- PTS used to evaluate sterilization procedures for life detection equipment
- Also analyzed collected ice samples for the presence of the bacterial molecule, endotoxin



- Analysis by the PTS unit validated standard cleaning procedures and identified bacterial molecules in particular sections of collected ice samples
- Both the PTS and Extended PTS were operated in conjunction with collection robots and spacesuits to simulate use on a future Mars exploration mission



● **Desert Research and Technology Study (D-RATS)**

- LOCAD-PTS tested and integrated into extra-vehicular activities (EVA) procedures at Meteor Crater and Cinder Lakes, AZ, test sites in 2005 and 2006.
- Conducted tests to monitor biological contamination associated with human exploration activities
- Evaluated the biological contamination of suit gloves during EVA
- Operational testing of LOCAD-PTS components during EVA to identify ease-of-use during EVA and potential use on lunar missions.



● **NASA Extreme Environment Mission Operations (NEEMO)**

- LOCAD-PTS used to monitor endotoxin within the underwater habitat *Aquarius*, Florida Keys, during NEEMO expedition 5 under command of astronaut Peggy Whitson.

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